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OLDMAN RESERVOIR MULE DEER

Procedures for Continued Monitoring
of Herd Productivity

Prepared for

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EXECUTIVE SUMMARY

This report contains recommendations for continued monitoring of the Oldman River Dam mule deer population. Recommendations are based on practical methods in response to the need for continued monitoring without continued use of radio telemetry. The majority of radio collars that were previously attached to adult females will begin to expire in February and March 1996.

Without the considerable and obvious advantages of radio telemetry, available field techniques for assessing population productivity and status include ground composition counts and aerial census. It is recommended that during early winter (preferably early December):

- *annual maximum composition counts are conducted on a herd unit basis, and that*
- *biannual aerial helicopter surveys are conducted in order to obtain total population counts.*

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1.2 Objective

The objective for this report was to present a sound, practical, and standardized procedure for continued monitoring of mule deer productivity and population status without the obvious and considerable advantages of radio telemetry. This report outlines:

- appropriate field methods, and
- recommends an implementation protocol and schedule.

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2.0 STUDY AREA

The Oldman Reservoir basin is approximately 12 km north of the town of Pincher Creek in southwestern Alberta (Fig. 1). The area is located in the fescue grassland ecoregion of southwestern Alberta, adjacent to the eastern edge of the Rocky Mountain foothills (Strong and Leggat 1992). The surrounding landscape is dominated by mixed-farming practices; hay crops, barley and wheat are the principle grains, and beef cattle are the dominant livestock (Alberta Agriculture 1991). A detailed description of the Reservoir and surrounding land base can be found in a variety of sources which have been presented in Hornbeck (1995).

2.1 Description of the Reservoir

Three river systems comprise the watershed and basin of the Oldman Reservoir: the Oldman River, the Crowsnest River and the Castle River (Fig. 1). The North Fork of the Oldman River drains the lower slopes of the Porcupine Hills. The Castle River drains the Carbondale Hills along the eastern slopes of the Rocky Mountains, while the Crowsnest River drains the southern slopes of the Livingstone Range. The reservoir basin occupies 15.4 km of the original Main Stem of the Oldman River. Approximately 12 km of the Castle River and 7.5 km of the Crowsnest River have been incorporated into the reservoir. The reservoir also extends about 5.4 km into the North Fork of the Oldman River. The volume of the reservoir at full supply level is 490,000 dam^3 with a surface area of approximately 1,842 ha (1,118.6 m asl). The shoreline at full supply level has a perimeter of about 104 km.

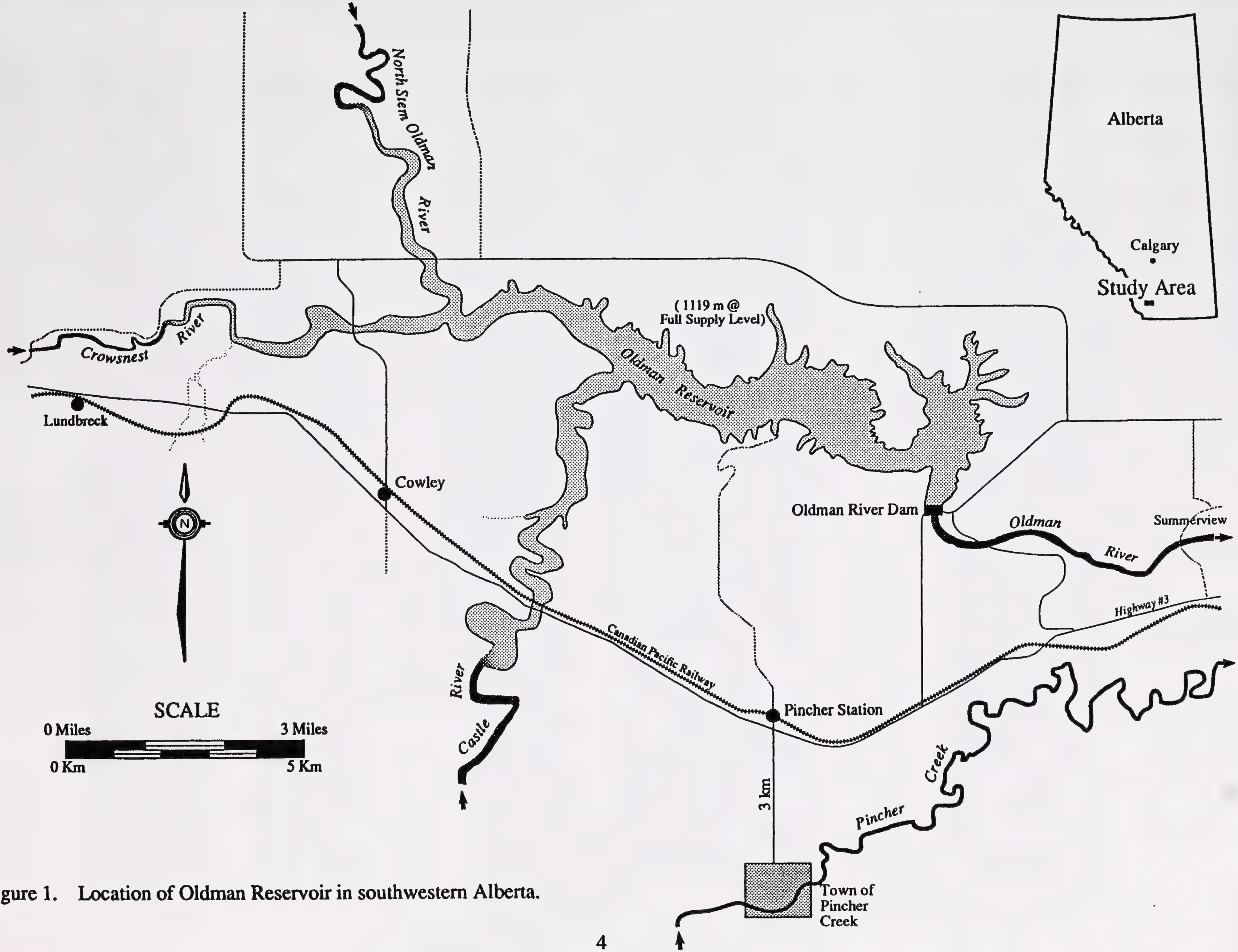

Figure 1. Location of Oldman Reservoir in southwestern Alberta.

3.0 DISCUSSION

Two key pieces of information bear on the population status of a mule deer herd: reproduction and mortality. Immigration and emigration do not appear to be a concern, based on observations of radioed deer. It is obvious that both of these factors operate on individuals and that study of individuals is important. Results of recent study of radio-collared individuals suggest that reproduction of mule deer at the Oldman River Dam is relatively high, and that mortality of adult females and neonates is low (Hornbeck 1995). The result of high reproduction and low mortality at the Oldman River Dam has been population growth that has been documented by a series of winter aerial surveys (Hornbeck 1994).

3.1 Reproduction

There are many influences on deer reproductive success, body condition and health of the individual female being perhaps the most important factor. Newborns in a population arrive at approximately the same time in early summer during a "birth pulse." Peak mule deer fawn births in southwestern Alberta occur during mid June (Hornbeck 1995). Even though births occur at a predictable time, and tend to occur in predictable places, the birth pulse can be relatively difficult to observe because the newborn deer are cryptic and spend most of their first 4 to 6 weeks in hiding to avoid natural predators. The birth pulse is relatively easy to observe, however, if adult females have been instrumented with radio collars. Radio collars allow the research biologist daily or hourly access to the exact location and status of these individuals.

Systematic observation of radio-collared females during the reproductive season at the Oldman Dam has demonstrated that relatively few fawns from unmarked does are observed even during intensive field studies during the fawning season (Hornbeck 1995). The conclusion from these studies was that it would be difficult to predict (forecast) the success of attempting to locate newborns without the advantages of using radio-collared females.

3.2 Mortality

Mortality also can be influenced by a large number of factors, and it is equally if not more difficult to study than reproduction. Generally, mortality occurs year long within a population; its effects are additive incrementally, and as a result it cannot be observed at any one point in time. Again, radio collars have allowed estimates of mortality rates, and can provide descriptions of ultimate and proximate causes within a population.

Important sources of mule deer mortality have not been identified at the Oldman River Dam. Informed speculation is that coyotes are the only predator in the system, but that their relatively low numbers in the study area preclude a large or significant impact. The other source of mortality is probably harvest, but unfortunately no information is available except that harvest appears to be particularly excessive on adult males. Other sources of mortality to deer include

road kills and accidents. Currently there is no information about these factors except that incidents of both have been observed.

3.3 Summary

The challenge on the horizon for management of the Oldman River Dam mule deer population is to monitor population characteristics without the technological advantages of radio collars. Population change can be understood by studying reproduction and mortality, the results of which can be observed by periodic population census.

Without radio collars, there is only one option available for identifying neonatal production, and this technique is labor intensive and is not practical or advisable for other reasons. A labor intensive effort would be required to "beat of the bushes" in known fawning areas, and this can be very intrusive. In addition to the cost of labor, this method presents several dangers to the newborn as a result of overt disturbances which may include displacement and the added possibility of abandonment of the fawn by its dam.

The other possibility for identifying herd productivity is to conduct sex and age composition counts. During winter, females with young-of-the-year join larger groups which include yearlings of both sexes and a few adult males. And during winter, deer herds tend to become more concentrated as snow cover reduces habitat availability. Appropriate timing for sex and age composition counts would be the early winter period before the long winter stress causes deer to become less active and more difficult to observe because at this time they tend to use more sheltered habitats.

Ground composition counts are not particularly labor intensive and can be accomplished by a single observer. In fact a single individual is preferred for reasons of efficiency and consistency. Also ground composition counts are not intrusive as deer can be classified from a distance that does not elicit or cause a flight response. The single largest concern with composition counts as a field technique is accuracy of identification. Considerable expertise is required in order to distinguish age classes among deer when they are at a distance and milling around. Accurately distinguishing age classes among groups of deer necessarily becomes more difficult when individuals are moving, and increases in difficulty with greater distance from the observer.

4.0 RECOMMENDATIONS

Without radio telemetry, it would be extremely inefficient and invasive to attempt a productivity estimate during the deer reproductive season. A ground-based field search would preclude the use of twinning rate as productivity assessment because the probability of observing both neonates would be low. The following recommendations assume the preferred use of radio telemetry is not available.

4.1 Annual Ground Composition Counts

For the purpose of monitoring population productivity, it is recommended that annual ground composition counts be conducted in conjunction with biannual winter aerial census (see Nilson and Green 1989). The composition count technique involves recording on a given survey date the number, and sex and age of a representative sample of mule deer by traveling across the entire study area. The single most important advantage of this technique is that it does not require expensive technology or equipment, and it is not particularly labor intensive. The single most important demand from this technique as mentioned is observer expertise, and the ability to travel across the study area to obtain a representative population sample. For composition counts to be useful, accurate representative classifications must be recorded year to year. This means the observer(s) must be knowledgeable and proficient, particularly at distinguishing the fawn age class from yearling and adult. This can only be accomplished with training and experience. Mistakes at sex and age classifications are easily made and variation among observers can be large.

Another important demand with composition counts is that not all deer within a population are observable during a given survey date. The proportion of animals visible at any one time can vary depending on a large number of variables many of which are beyond the control of the observer. Variables such as time of day, area searched and weather conditions can be carefully controlled for, but other factors such as local disturbances and deer movements cannot. Therefore, the key to achieving a representative sample is obtaining access to the deer range and standardization of applying the technique. Thirdly, the use of a maximum count based on several independent recounts (samples) of the population on different dates is recommended. Three independent recounts are desirable, at least two are required for a maximum count.

4.1.1 Protocol

The following considerations and standardizations for ground composition counts are recommended.

Proficiency of the Observer.

The need to collect accurate sex/age classifications must be emphasized. This can be improved by using current, experienced observers. Volunteer labor with little experience may severely compromise precision of the results. Self instruction by non-biologists or biologists without experience with mule deer is not recommended. Professional help should be requested.

In addition, team members should frequently consult each other to maintain high level of motivation needed for accuracy.

Proficiency can be improved with high quality optics (a combination of 10x by 50 mm binoculars and 10-40x by 50 mm scope is recommend), and by arranging the best available vantage points to view the deer. The concept is to get close to the deer for optimum viewing conditions (optimum means balancing close approach with the need not to cause the deer to become alarmed, mill and then flee). If one accepts a vantage point that is too far, the ability to discriminate age classes will be reduced. Experience is the best guide, but it is suggested that the observer should attempt to approach to within 200 to 300 m. The observer should practice estimating distance ahead of time. It is also recommended that the observer practice with classifications to gain a strong 'search image' for identifying fawns before starting an 'official' count.

Access to Mule Deer Range.

Each composition count should strive to be representative, conducted in a manner that attempts to give every deer in the population an equal chance of being classified. The intent for each count is to classify as many animals as possible from the entire mule deer range. Generally, it is not advisable to classify only a few large herds. Firstly, classifications from large herds are difficult as individuals are intermixing etc. Secondly, large herds may have a biased sex/age composition whereby females with fawns may be under represented in large herds. It is recommended that based on experience, the observer should attempt during each count to seek out favored deer habitats in order to gain representation within the population. In other words, this is more of an exercise of "going to look for deer in all their favorite places" rather than an exercise of "counting the deer as they appear in large open fields." All the favored places will have to be worked out by some trial and error at the outset, but generally these places are known from past experience.

Use of Maximum Count.

The concept is to repeat the composition counts of the entire population once (two estimates) or twice (three estimates) and then select from these independent recounts the one count with the maximum fawn ratio or male ratio. Recounts do not address the accuracy of the estimate, but this technique does deal with precision which is a measure of consistency. Accuracy is less a problem if precision can be achieved, because it is the relative change in a population parameter year to year that is important.

Maintain Same Annual Survey Dates.

It is recommended that composition counts be conducted during early winter, preferably early December of each year. December follows the conclusion of the rut which occurs in late November, and occurs at a time when antlers are still being carried by young males and by the majority of older males. Morning hours are recommended for ground composition counts as this is generally an active time of day for ungulates. The exact timing will be determined with experience in traveling the study area, but should be approximately 0800 to 1400 hrs.

Maintain Same Survey Area.

The aim should be to classify a large percentage of the known population during each count. A standardized survey area and route is recommended as the best approach for achieving

this particular objective. Attention should be given to both road and foot access so that all important habitat areas of the reservoir can be searched using the best vantage points. Important areas for various herd units are known from earlier research (e.g., North Fork, Stevik's, Crowsnest etc.) and access to these areas should be standardized. Experience will serve as a guide, but initially the target should be to classify several hundred deer during each count (i.e., ≥ 30% of the population, but the greater the percent the better).

Based on acquired experience, helicopter access for locating individual herds and identifying vantage points that would allow suitable ground counts may be required. The suggestion is that helicopter-assisted counts may provide more reliable results. Granted, helicopter assistance for composition counts significantly increases the cost. However, gaining reliable information is an important issue. It is recommended that a "test" of the efficiency of ground counts conducted by vehicle and foot searches versus efficiency of helicopter-assisted ground counts be conducted as part of program design at the outset.

Maintain Same Search Intensity.

This will be aided by all standardizations, but consideration should be given to allocating equal search effort for each recount within a given year, and that equal effort be allocated between years. Counts should be as complete as possible and abandoned during inclement weather and rescheduled.

Analysis of Herd Composition Data.

Each composition count for a given date will consist of the pooled results from all individuals and groups classified to provide a single best estimate for the population. A standardized field data form is recommended (refer to the example that is attached). The resulting estimate of fawns:100 females would not have a statistical error associated with it, however, this would be possible if the composition counts were repeated a large number of times (sampling with replacement).

The important ratio from composition counts is the number of fawns per 100 females (adults and yearlings) as this is an indication of overall herd reproductive performance. Without the advantage of radio-collared females, which allows a biologist to observe the number of fawns at parturition, the number of early winter fawns (December composition count) per 100 females is the next best available estimate of mule deer productivity. The use of a maximum count among several recounts of the population provides confidence that a representative sample has been obtained. It would also be worth the effort to summarize for each count the number of yearling males per 100 females, and the number of adult males per 100 females (yearling and adult are distinguished by antler development - yearlings produce spike antlers or small forks). The success or failure of wildlife management harvest regimes also can be monitored with standardized ground composition counts.

4.2 Winter Aerial Census

Herd composition ratios are not coupled to population size (McCullough 1994). There are ambiguities in composition counts such that changes in fawn:female ratios can occur in any number of ways, such as females increase while numbers of fawns remain the same, or females remain constant while the number of fawns increase. Therefore, composition counts have limitations for inferencing population size and change. An independent estimate of population size is needed to validate demographic changes that might be indicated by composition counts, such as an aerial survey total count. Therefore, it is recommended that biannual (every second year) helicopter surveys be conducted (Nilson and Green 1989). It is further recommended that aerial surveys be conducted with the same attention to standardized methods applied to earlier surveys (Hornbeck 1994).

There is no direct link between ground composition counts and aerial survey information, except that they are both attempting to illuminate the mule deer's population status. The more information gained, the greater the confidence in understanding and predicting changes that may be occurring to the mule deer population. For example, if aerial surveys show an increase in the population, and relatively high productivity estimates of the herd have also been documented, a compelling argument can be constructed that the population is increasing.

It is recommended that attempts to classify fawns continue during biannual helicopter surveys, and that ground-based composition counts are conducted concurrently in order to compare results from the two methods. The prediction is that ground-based counts will provide larger numbers of fawns in the study area because during aerial surveys a large number of fawns likely will be classified as adults because of such factors as flying conditions, observer fatigue, and ground snow conditions. In addition, the "test" referred to earlier under the subject of maintaining same survey area, can be initiated during the next biannual aerial survey. The test would be a comparison of helicopter-assisted ground classification counts with ground-based classifications obtained solely with vehicle and foot searches of the study area. The prediction is that helicopter-assisted ground classification counts would provide higher and more consistent fawn ratios by achieving better representation of the total mule deer population. Therefore, during the next biannual helicopter survey, three sets of classifications could be obtained: sex/age classifications obtained from the helicopter during the two day survey; helicopter-assisted ground classifications on day three following the aerial survey; followed by ground classifications obtained solely by vehicle and foot travel on day four.

4.3 Implementation Schedule

It is recommended that annual sex and age composition counts be conducted during the early winter period, preferably during early December. If possible, a Christmas Deer Count should be scheduled each year prior to this winter holiday. Three (3) recounts are recommended, and these should be conducted each year within a few days of each other. The count that provides the maximum ratio of fawns:100 females should be used to represent the actual composition of the population.

On a biannual basis, it is further recommended that winter aerial census be conducted, also in early winter. Early winter is preferable because this tends to be the time of year with the greatest chance of new snow providing continuous ground cover. With aerial census, continuous snow cover yields the best results. Later in winter, snow cover becomes patchy and this presents a large amount of visual interference for observing deer, particularly when deer are more closely associated with trees and tall shrub habitats.

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Attachment.

Hypothetical example of two mule deer herd composition counts.

First Count: 10 Dec.‘ 96					Second Count: 14 Dec ‘ 96				
Location	Group	fawn	Female	Male	Location	Group	fawn	Female	Male
N. Fork	1	3	8	1	N. Fork	1	1	2	5
	2	4	15	2		2	2	6	8
Crowsnest	1	2	2		Crowsnest	1	3	10	1
	2	4	21	3		2	4	20	1
Main Stem	1	4	8		Main Stem	1	6	19	
	2	3	6	1		2	3	7	1
	3	5	21			3	6	24	3
Castle	1	0	6	0	Castle	1	4	6	0
	2	0	11	0		2	1	2	0
Total (pooled)		25	98	7	Total		30	96	19

Fawn Ratio	25.5 fawns:100 Females	31.2 fawns:100 Females
Percent fawns	(25/ 130) = 19.2%	(30/ 145) = 20.6%
Male ratio	7.1 males:100 females	19.8 male:100 females

Best available estimate of fawn composition = 31.2:100. Best available estimate of male composition is 20.6:100 females. It may occur that the maximum estimate for fawn composition lies within the first count, while the maximum estimate for male composition lies within the second count.

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